



Safety Data Sheet

Material Name: Fluorine

Section 1 - IDENTIFICATION

Manufacturer Information

Electronic Fluorocarbons LLC
3266 Bergey Road
Hatfield PA 19440

General Information: 1-215-443-9600
Emergency #: 1-800-535-5053
Outside the US: +1-352-323-3500 (Call collect)

Product Identifier: Fluorine

Product Use

Synthetic/Analytical chemistry.

Section 2 - HAZARDS IDENTIFICATION

OSHA/HCS Status

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the Substance or Mixture

OXIDIZING GASES - Category 1
GASES UNDER PRESSURE - Compressed gas
ACUTE TOXICITY (inhalation) - Category 1
SKIN CORROSION/IRRITATION - Category 1
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (respiratory tract) - Category 1

GHS LABEL ELEMENTS

Symbol(s)



Signal Word

DANGER

Hazard Statement(s)

May cause or intensify fire; oxidizer.
Contains gas under pressure; may explode if heated. Extremely Reactive.
Fatal if inhaled.
Causes severe skin burns and eye damage. Causes serious eye damage.
Corrosive to the respiratory tract.

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Precautionary Statement(s)

General

Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Open valve slowly. Use only with equipment cleaned for Oxygen service. Use only with equipment passivated before use. Use behind barricades with remote extensions on valves and regulators.

Prevention

Wear protective gloves. Wear eye or face protection. Wear respiratory protection. Keep away from clothing, incompatible materials and combustible materials. Keep reduction valves free from grease and oil. Use only outdoors or in a well-ventilated area. Do not breathe gas. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Use and store only outdoors or in a well ventilated place.

Response

In case of fire: Stop leak if safe to do so. IF exposed: Call a POISON CENTER or physician. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage

Store locked up. Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal

Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards Not Otherwise Classified

In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component Name	Percent
7782-41-4	Fluorine	100

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

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***Section 4 - FIRST AID MEASURES**

Inhalation

Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Eyes

Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Ingestion

As this product is a gas, refer to the inhalation section.

Note to Physicians

Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Protection of First Aiders

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Symptoms: Immediate

eye damage, burns, frostbite, fatal if inhaled

Over-exposure Signs/Symptoms

pain, watering, red eyes; skin irritation, redness, blistering; stomach pains

***Section 5 - FIRE FIGHTING MEASURES**

Suitable Extinguishing Media

Use an extinguishing agent suitable for the surrounding fire.

Unsuitable Extinguishing Media

None Known

Specific Hazards Arising From the Chemical

Contains gas under pressure. Oxidizing material. This material increases the risk of fire and may aid combustion. Contact with combustible material may cause fire. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

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Hazardous Thermal Decomposition Products

halogenated compounds

Special Protective Actions for Fire-Fighters

Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk.

Special Protective Equipment for Fire-Fighters

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

*****Section 6 - ACCIDENTAL RELEASE MEASURES*****

For Non-Emergency Personnel

No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For Emergency Responders

If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental Precautions

Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and Materials for Containment and Cleaning Up

Small Spill: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large Spill: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

*****Section 7 - HANDLING AND STORAGE*****

Protective Measures

Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep away from clothing, incompatible materials and combustible materials. Keep reduction valves free from grease and oil. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

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Advice on General Occupational Hygiene

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for Safe Storage, Including any Incompatibilities

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Separate from acids, alkalis, reducing agents and combustibles. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

*****Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION*****

Occupational exposure limits

Ingredient name	Exposure limits
fluorine	<p>ACGIH TLV (United States, 3/2012). STEL: 3.1 mg/m³ 15 minutes. STEL: 2 ppm 15 minutes. TWA: 1.6 mg/m³ 8 hours. TWA: 1 ppm 8 hours.</p> <p>NIOSH REL (United States, 1/2013). TWA: 0.2 mg/m³ 10 hours. TWA: 0.1 ppm 10 hours.</p> <p>OSHA PEL (United States, 6/2010). TWA: 0.2 mg/m³ 8 hours. TWA: 0.1 ppm 8 hours.</p> <p>OSHA PEL 1989 (United States, 3/1989). TWA: 0.2 mg/m³ 8 hours. TWA: 0.1 ppm 8 hours.</p>

Appropriate engineering controls

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

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Eye/face protection	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Hand protection	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Body protection	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Other skin protection	Appropriate footwear and any additional skin protection measures should be selected
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Gas	Appearance: pale-yellow to greenish gas
Color: Yellowish	Physical Form: gas
Odor: pungent odor	Odor Threshold: Not available
pH: Not available	Melting/Freezing Point: -219.61 °C
Boiling Point: -188°C	Flash Point: flammable
Decomposition: Not available	Evaporation Rate: Not available
LEL: Not available	UEL: Not available
Vapor Pressure: Not available	Vapor Density (air = 1): 1.312
Specific Gravity (water=1): Not available	Water Solubility: Not available
Log KOW: Not available	Coeff. Water/Oil Dist: Not available
Auto Ignition: Not available	Viscosity: Not available
Molecular Weight: 38 g/mole	Molecular Formula: F ₂

Section 10 - STABILITY AND REACTIVITY

Chemical Stability

Product is Stable

Conditions to Avoid

No specific data

Possibility of Hazardous Reactions

contact with combustible materials, risk of causing fire

Incompatible Materials

reducing materials, combustible materials, organic materials, metals, alkalis and moisture.

Hazardous Decomposition

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous Polymerization

Under normal conditions of storage and use, hazardous polymerization will not occur.

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Section 11 - TOXICOLOGICAL INFORMATION

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
fluorine	LC50 Inhalation Gas.	Rat	185 ppm	1 hours

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
fluorine	Eyes - Mild irritant	Human	-	5 minutes 25 parts per million	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
fluorine	Category 1	Not determined	respiratory tract

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure Not available.

Potential acute health effects

Eye contact	Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	Fatal if inhaled. May give off gas, vapor or dust that is very irritating or corrosive to the respiratory system.
Skin contact	Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.
Ingestion	May cause burns to mouth, throat and stomach. As this product is a gas, refer to the inhalation section.

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Symptoms related to the physical, chemical and toxicological characteristics

Eye contact	pain, watering, redness
Inhalation	No specific data.
Skin contact	pain or irritation, redness, blistering may occur
Ingestion	stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects

Not available.

Potential delayed effects Long term exposure Not available.

Potential immediate effects Not available.

Potential delayed effects Not available.

Potential chronic health effects

Not available.

General No known significant effects or critical hazards.

Carcinogenicity No known significant effects or critical hazards.

Mutagenicity No known significant effects or critical hazards.

Teratogenicity No known significant effects or critical hazards.

Developmental effects No known significant effects or critical hazards.

Fertility effects No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12 - ECOLOGICAL INFORMATION

Toxicity

Not available

Persistence and Degradability

No data available.

Bioaccumulative Potential

Bioconcentration potential in aquatic organisms is low based on a BCF value of 3.2.

Mobility in Soil

Not available

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Section 13 - DISPOSAL CONSIDERATIONS



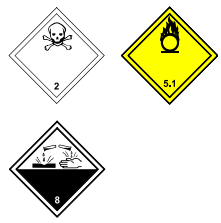


Disposal Methods

The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

United States-RCRA Acute Hazardous Waste "P" List

Ingredient	CAS #	Status	Reference number
Fluorine	7782-41-4	Listed	P056

Section 14 - TRANSPORT INFORMATION

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1045	UN1045	UN1045	UN1045	UN1045
UN proper shipping name	FLUORINE, COMPRESSED	FLUORINE, COMPRESSED	COMPRESSED, FLUORINE	FLUORINE, COMPRESSED	FLUORINE, COMPRESSED
Transport hazard class(es)	2.3 (5.1, 8) 	2.3 (5.1, 8) 	2.3 (5.1, 8) 	2.3 (5.1, 8) 	2.3 (5.1, 8) 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	Inhalation hazard zone A Reportable quantity 10 lbs / 4.54 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation: Forbidden. Special provisions 1	Explosive Limit and Limited Quantity Index 0 ERAP Index 25 Passenger Carrying Ship Index Forbidden Passenger Carrying Road or Rail Index Forbidden Special provisions 38	-	-	Passenger and Cargo Aircraft Quantity limitation: 0 Forbidden Cargo Aircraft Only Quantity limitation: 0 Forbidden

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“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Special precautions for user

Transport within user’s premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not available.

Section 15 - REGULATORY INFORMATION
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U.S. Federal regulations

TSCA 8(a) CDR Exempt/Partial exemption: Not determined
United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)

Clean Air Act (CAA) 112 regulated toxic substances: fluorine
 Not listed

Clean Air Act Section 602 Class I Substances Not listed

Clean Air Act Section 602 Class II Substances Not listed

DEA List I Chemicals (Precursor Chemicals) Not listed

DEA List II Chemicals (Essential Chemicals) Not listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
fluorine	100	Yes.	-	-	-	-

SARA 304 RQ Not applicable.

SARA 311/312

Classification Sudden release of pressure, Immediate (acute) health hazard

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Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
fluorine	100	No.	Yes.	No.	Yes.	No.

SARA 304 RQ Not applicable.

SARA 311/312

Classification Sudden release of pressure, Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
fluorine	100	No.	Yes.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	fluorine	7782-41-4	100
Supplier notification	fluorine	7782-41-4	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

- Massachusetts** This material is listed.
- New York** This material is listed.
- New Jersey** This material is listed.
- Pennsylvania** This material is listed.
- Canada inventory** This material is listed or exempted.

International regulations

International Lists

- Australia inventory (AICS):** This material is listed or exempted.
- China inventory (IECSC):** This material is listed or exempted.
- Japan inventory:** Not determined.
- Korea inventory:** This material is listed or exempted.
- Malaysia Inventory (EHS Register):** Not determined.
- New Zealand Inventory of Chemicals (NZIoC):** This material is listed or exempted.
- Philippines inventory (PICCS):** This material is listed or exempted.
- Taiwan inventory (CSNN):** Not determined.

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**Chemical Weapons Convention List
Schedule I Chemicals** Not listed

**Chemical Weapons Convention List
Schedule II Chemicals** Not listed

**Chemical Weapons Convention List
Schedule III Chemicals** Not listed

Canada

WHMIS (Canada)

Class A: Compressed gas.

Class D-1A: Material causing immediate and serious toxic effects (Very toxic).

Class E: Corrosive material

Class F: Dangerously reactive material.

CEPA Toxic substances: This material is not listed.

Canadian ARET: This material is not listed.

Canadian NPRI: This material is listed.

Alberta Designated Substances: This material is not listed.

Ontario Designated Substances: This material is not listed.

Quebec Designated Substances: This material is not listed.

* * *Section 16 - OTHER INFORMATION* * *

NFPA Ratings: Health: 3 Fire: 0 Reactivity: 3

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

Other Information

Electronic Fluorocarbons makes no express or implied warranties, guarantees or representations regarding the product or the information herein, including but not limited to any implied warranty or merchantability or fitness for use. Electronic Fluorocarbons shall not be liable for any personal injury, property or other damages of any nature, whether compensatory, consequential, exemplary, or otherwise, resulting from any publication, use or reliance upon the information herein.